



Armstrong Products Division

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SURFACE PREPARATION PROCEDURES FOR BONDING OR COATING

Where maximum adhesive properties are required, careful preparation of the surface to be bonded is essential. The method used will be dependent upon the type of contaminant involved, and the type of material from which the contaminant is being removed.

The proper cleaning of any surface for adhesive bonding or epoxy coating evolves three basic steps:

1. Degreasing - Vapor degreasing with trichlorethylene is highly recommended. Solvent washing with a solvent such as methyl ethyl ketone is also acceptable.
2. Chemical etching or mechanical abrading - The preferred method of mechanical abrading is the use of aluminum oxide or sand blasting. The use of a medium grit emery paper to roughen the surface is frequently quite acceptable.
3. Degreasing - This final degreasing operation is very important. All mechanically abraded or sand blasted surfaces should be brushed vigorously with a stiff bristled brush to remove embedded particles prior to the final degreasing operation.

Parts should be bonded or coated as soon as possible after pre-treatment.

There are numerous methods that may be used to prepare various surfaces for adhesive bonding or epoxy coating. The following are a few of the more commonly used techniques. For additional information no material not covered herein, please contact our Technical Department.

ALUMINUM, ALCAD OR 24ST

1. Degrease
2. Clean the surface with a chromic acid solution by immersion at 63-70 °C for 5-10 minutes. Prepare the solution as follows:
 10 parts / wt. Sodium Dichromate
 30 parts / wt. 96% Sulfuric Acid
 100 parts / wt distilled water.

(Dissolve the Dichromate in most of the water, add Sulfuric Acid, stirring carefully and then add the remaining water.)

3. Rinse the metal thoroughly with clear running water and dry well. (If compressed air is used, extreme care should be taken to see that no oil is sprayed on the surface from the compressed air system.)
4. For best results, parts should be coated or bonded immediately.

CAST IRON

Degrease, abrade, degrease again.

CONCRETE (Portland Cement Type)

1. Concrete contaminated with oil or grease must first be scrubbed with a commercially available concrete degreasing compound followed by a thorough flushing with water.
2. New or old concrete can be prepared for bonding by either sand blasting or with a chemical etch. Concrete is chemically etched with a 15% solution by weight of Hydrochloric Acid. This solution is spread generously over the concrete surface with a stiff bristled broom. When bubbling subsides, rinse thoroughly with a hose until loose particles and acid have been removed. Allow surface to dry thoroughly.

COPPER AND ITS ALLOYS (Brass)

430 parts/volume Sulfuric Acid
 72 parts/volume Nitric Acid
 490 parts/volume water

Procedure: Dip 15 seconds in above solution, rinse in running tap water (25 °C) five seconds, dip in 15% (volume) Hydrochloric Acid, followed by a 2 minute rinse in running tap water (25 °C).

The following formula may be used:

8.0 parts/wt. Ferric Chloride solution
 16.3 parts/wt. Nitric Acid
 75.7 parts/wt. water

Immerse the parts 1-2 minutes at room temperature, followed by thorough water rinse and air dry at 60-65 °C.

DIALLYL PHTHALATE

Degrease, abrade the surface and degrease again.

GALVANIZED OR ZINC FINISHED MATERIALS

Degrease, sand blast and degrease again or use the following etching procedure:

- 20 parts/wt. concentrated Hydrochloric Acid
- 80 parts/wt. distilled water

Treat as follows:

1. Degrease
2. Immerse the metal in the hydrochloric acid for 2-4 minutes at room temperature.
3. Rinse in cold running, distilled or deionized water.
4. Dry in an oven for 20-30 minutes at 60-70 °C.
5. Apply adhesive as soon as possible.

GLASS

For normal bonding applications, degreasing alone is sufficient for pre-treating glass surfaces. If, however, the very optimum strength is required, the glass can be grit blasted with very fine grit until the surface appears frosted.

LEAD

Degrease, abrade and degrease again.

LEATHER

Solvent wipe, roughen with sandpaper and solvent wipe.

MAGNESIUM AND ITS ALLOYS

1. Vapor degrease with stabilized Trichlorethylene.
2. Immerse in 10% Sodium Hydroxide for 10 minutes at 76-87 °C.
3. Rinse 5 minutes in a cold water spray.
4. Immerse in a solution of 1½ lbs. Chromic Acid, ¼ lb. Sodium Nitrate in 1 gallon of water for 8 minutes at room temperature.
5. Rinse approximately 3 minutes.
6. Immerse in a 20% solution of Hydrofluoric Acid for 5 minutes at room temperature.
7. Rinse ½ - 1 minute.
8. Immerse in a boiling solution of Sodium dichromate 10-15%, and Calcium Fluoride 0.15% for 30 minutes.
9. Rinse 1-2 minutes.
10. Dry in a hot air blast (71-98 °C) for 10 minutes.

11. Bond immediately or apply a Zinc primer for protection of freshly etched surfaces.

SILICONE STEEL

- 8.0 parts/wt. Hydrochloric Acid
- 7.8 parts/wt. Sulfuric Acid
- 84.2 parts/wt. Nitric Acid

The parts should be immersed in the above solution (maintained at 70-75 °C) for 10-20 minutes, then rinsed with water at room temperature and brushed with soap solution to mechanically remove scale loosened by the chemical bath. A hot water rinse (70-75 °C) followed by a hot air dry (70-75 °C) completes the preparation.

STAINLESS STEEL

1. Degrease
2. Etch for 10 minutes at 65-68 °C in a solution containing:
 - 90 parts/wt. water
 - 37 parts/wt. 96% Sulfuric Acid
 - 0.2 parts/wt. Nacconol NR (National Aniline)
3. Rinse with tap water or distilled water.
4. Immerse for 10 minutes at room temperature in a water solution containing:
 - 88 parts/wt. water
 - 15 parts/wt. concentrated Nitric Acid
 - 2 parts/wt. Hydrofluoric Acid
5. Rinse in distilled water and dry in a 95 °C oven.

TEFLON

Teflon must be etched prior to bonding with a sodium naphthalene solution such as Bondaid. Trial quantities of Bondaid can be purchased from Armstrong Products Co., Inc. Sources for other proprietary formulations will be furnished on request. Teflon and other fluorocarbon plastics are available in a bondable form from most suppliers.

PHENOLIC RESINS, POLYESTER RESINS, POLYURETHANE RESINS

Degrease, abrade and degrease again.

CHLORINATED POLYETHER (Penton), POLYETHYLENE, POLYPROPYLENE, POLYFORMALDEHYDE (Delrin)

Either of the following formulas may be used for these plastics:

1. 10 parts/wt. Potassium Dichromate
20 parts/wt. distilled water
320 parts/wt. Sulfuric Acid concentrated.
2. 15 parts/wt. Sodium Dichromate
24 parts/wt. distilled water
300 parts/wt. concentrated Sulfuric Acid

Prepare as follows: Dissolve the Sodium Dichromate or Potassium Dichromate in water and add the Sulfuric Acid carefully, with constant stirring.

Treat as follows:

1. Degrease
2. Immerse in the chromic acid as follows:
 - a. Polyether (chlorinated) 5-10 minutes at 65-70 °C.
 - b. Polyethylene & Polypropylene* 60-90 minutes at room temperature OR 1-2 minutes at 65-70 °C.
 - c. Polyformaldehyde 10-20 seconds at room temperature.
3. Rinse thoroughly with cold running, distilled or deionized water.
4. Air dry.
*25-50% longer times may be required for etching high density polyethylene and polypropylene.

RUBBER

Surface etching of rubber is recommended for maximum bond strength. A satisfactory bonding surface can be obtained by using the following cyclizing technique:

Immerse the rubber in concentrated sulfuric acid (sp. gr. 1.84) for 5-10 minutes in the case of natural rubber and 10-15 minutes of synthetic rubber. Many rubbers are very acid resistant and will require longer cyclizing times to reach a point where the rubber will have fine cracks when flexed.

Alternatively, a paste of a concentrated Sulfuric Acid and Barytes can be used. The paste is made by adding Barytes to the acid to give a consistency which will not run. After washing thoroughly with water and drying, the brittle surface of the rubber should be broken by flexing so that a finely cracked surface is produced. It may be necessary to wash with dilute caustic solution to insure neutralization of residual acid which, if not removed, will consume some of the curing agent, weakening the bond strength. The surface is then ready for application of the adhesive.

TIN

Degrease, abrade and degrease again.

TITANIUM

In general, an acid etch is the most effective surface treatment for titanium. Anodizing in 15% Sulfuric Acid or etching in hot Sulfuric Acid solution followed by cleaning in Alkanex detergent-sodium metasilicate solution produces good results. Still

better results are obtained if the titanium surface is first plated with a metal such as aluminum or nickel.

WOOD

Remove any contaminating materials such as oil, rot, etc., with a sander, ax, or plane. Make certain the wood is dry. Smooth with sandpaper.